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Semiconductor exposure process - comprises ordering number of wafer pieces, setting process time, computing time for exposure and displaying computed values

Patent Assignee: CANON KK (CANO)
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Abstract (Basic): JP 8045828 A

Process comprises ordering a number of pieces of wafer for one lot, setting a process time for processing each part of exposure, computing time needed for exposure processing or finish time of the processing, and displaying computed values.

USE - For easily showing an operator an estimated finish time of exposure processing.

Dwg.1/5

Title Terms: SEMICONDUCTOR; EXPOSE; PROCESS; COMPRISE; ORDER; NUMBER; WAFER ; PIECE; SET; PROCESS; TIME; COMPUTATION; TIME; EXPOSE; DISPLAY; COMPUTATION; VALUE
Derwent Class: G06; L03; P84; U11
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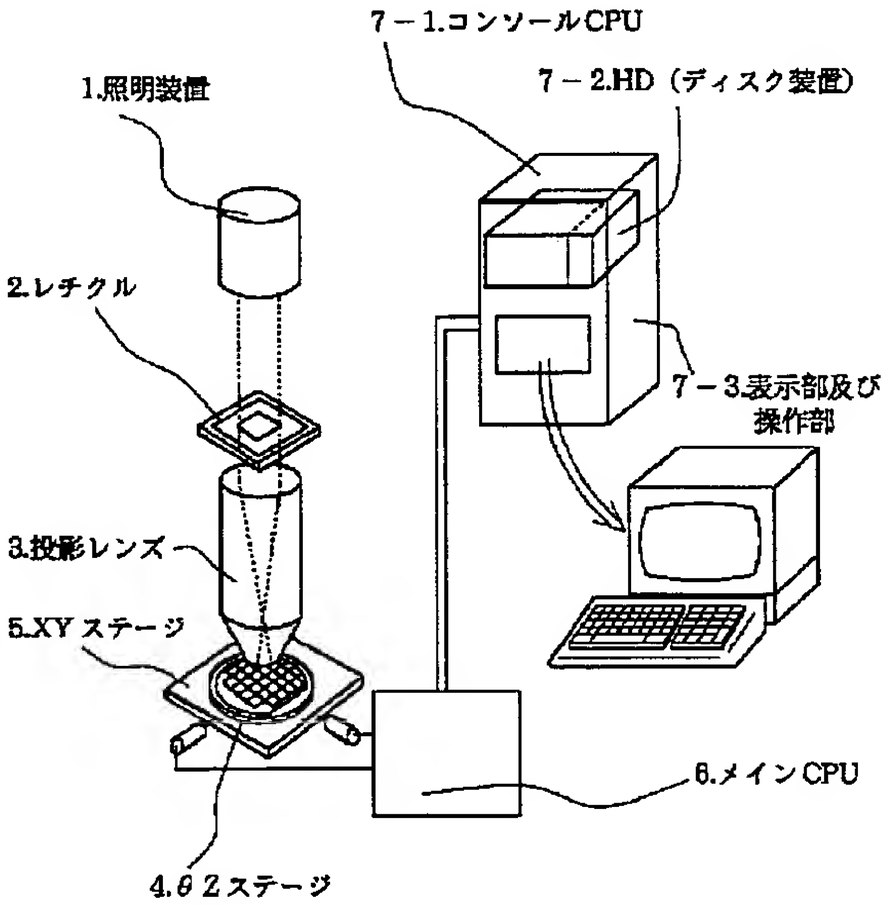
(54)【発明の名称】　半導体露光装置

(57)【要約】

【目的】　作業者が容易に処理終了予測時間および時刻を把握できるようにし、もって露光装置を効率的に運用することができるようにする。

【構成】　露光処理を行なう１ロットのウエハの枚数を指定する枚数指定手段７－３と、前記露光処理の各部分的処理に要する処理時間の情報を設定する設定手段７と、前記指定手段により指定されたウエハ枚数および前記設定手段により設定された処理時間情報に基づいて前記１ロットの露光処理に要する時間もしくはその処理の終了時刻を算出する算出手段７－１と、これによって算出された値を表示する表示手段７－３とを具備することを特徴とする半導体露光装置。



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【特許請求の範囲】

【請求項１】　露光処理を行なう１ロットのウエハの枚数を指定する枚数指定手段と、前記露光処理の各部分的処理に要する処理時間の情報を設定する設定手段と、前記指定手段により指定されたウエハ枚数および前記設定手段により設定された処理時間情報に基づいて前記１ロットの露光処理に要する時間もしくはその処理の終了時刻を算出する算出手段と、これによって算出された値を表示する表示手段とを具備することを特徴とする半導体露光装置。

【請求項２】　設定手段は前記露光処理の種類に応じた前記処理時間情報を記憶している記憶手段と、その露光処理の種類を指定する種類指定手段と、これによって入力された種類に対応する露光処理の処理時間情報を前記記憶手段から読み出す読出手段とを備えることを特徴とする請求項１記載の半導体露光装置。

【請求項３】　前記部分的処理に要する時間を測定する測定手段と、この測定結果に基づいて前記記憶手段に記憶されている処理時間情報を補正する補正手段とを有することを特徴とする請求項２記載の半導体露光装置。

【請求項４】　表示手段は前記１ロットの露光処理のスタート時に前記時間または時刻を表示するものであることを特徴とする請求項１～３いずれかに記載の半導体露光装置。

【請求項５】　枚数指定手段および設定手段は露光処理とは無関係にいつでも操作可能であり、これらが操作されたとき前記算出手段および表示手段はその処理を行なうものであることを特徴とする請求項１～３のいずれかに記載の半導体露光装置。

【請求項６】　前記表示手段に対して前記時間または時刻の表示を任意のときに行なわせるための指令手段を有することを特徴とする請求項１～５いずれかに記載の半導体露光装置。

【請求項７】　前記ロットにおけるウエハの未処理枚数をカウントする手段を有し、算出手段は、何らかの理由により装置が停止してから装置が回復した時には、前記処理時間情報および前記未処理枚数に基づき、未処理ウエハの処理に要する時間またはその処理の終了時刻を算出するものであり、表示手段はその算出値を表示するものであることを特徴とする請求項１～６いずれかに記載の半導体露光装置。

【発明の詳細な説明】

【０００１】

【産業上の利用分野】本発明は、ウエハ上に回路パターンを焼き付ける半導体露光装置に関し、ロット単位での処理時間および終了時刻を表示できるようにしたものに関する。

【０００２】

【従来の技術】半導体の製造に用いられる半導体露光装置、例えばステッパは、多数のウエハをロット単位で処

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理する。このとき、ロットにより露光条件、アライメント条件等が異なる。従来、このロット単位の処理終了時間および時刻は、それまでの経験等から作業者が予測している。

【０００３】

【発明が解決しようとする課題】しかしながら、この処理終了時間および時刻は露光パラメータ、ステッパの内部パラメータ等により変化するので、作業者が正確な終了時刻を予測するのは困難である。よって実際には作業者が装置を見て回る必要があったり、装置に空き時間が生じたりするといった問題点がある。半導体製造工場では設備のコストが高いため、装置をできるだけ空けずに稼働させることが製品のコスト管理の上で重要になる。特に、多品種少量生産のラインや、新製品の試作ライン等では、１台の露光装置に色々なウエハを流すので、前述のような問題点が起きることが多い。

【０００４】本発明は上記事情を考慮したもので、半導体露光装置において、作業者が容易に処理終了予測時間および時刻を把握できるようにし、もって露光装置を効率的に運用することができるようにすることを目的とする。

【０００５】

【課題を解決するための手段】この目的を達成するため本発明の半導体露光装置は、露光処理を行なう１ロットのウエハの枚数を指定する枚数指定手段と、前記露光処理の各部分的処理に要する処理時間の情報を設定する設定手段と、前記指定手段により指定されたウエハ枚数および前記設定手段により設定された処理時間情報に基づいて前記１ロットの露光処理に要する時間もしくはその処理の終了時刻を算出する算出手段と、これによって算出された値を表示する表示手段とを具備する。

【０００６】より具体的な態様を例示すれば、次のようである。すなわち、設定手段は露光処理の種類に応じた前記処理時間情報を記憶している記憶手段と、その露光処理の種類を指定する種類指定手段と、これによって入力された種類に対応する露光処理の処理時間情報を前記記憶手段から読み出す読出手段とを備える。本装置はさらに、前記部分的処理に要する時間を測定する測定手段と、この測定結果に基づいて前記記憶手段に記憶されている処理時間情報を補正する補正手段とを有する。表示手段は前記１ロットの露光処理のスタート時に前記時間または時刻を表示するものである。枚数指定手段および設定手段は露光処理とは無関係にいつでも操作可能であり、これらが操作されたとき前記算出手段および表示手段はその処理を行なうようにしてもよい。本装置はさらに前記表示手段に対して前記時間または時刻の表示を任意のときに行なわせるための指令手段を有する。本装置はさらに前記ロットにおけるウエハの未処理枚数をカウントする手段を有し、算出手段は、何らかの理由により装置が停止してから装置が回復した時には、前記処理時

間情報および前記未処理枚数に基づき、未処理ウエハの処理に要する時間またはその処理の終了時刻を算出するものであり、表示手段はその算出値を表示するものである。

【０００７】

【作用】この構成において、露光装置を用いて露光処理を行なう際等において、１ロットの露光処理に要する時間もしくはその処理の終了時刻を表示させるためには、枚数指定手段により１ロットの処理ウエハの枚数を指定し、また設定手段により処理時間情報を設定する。この処理時間情報は、露光時間やステップ回数等の露光パラメータやステッパ内部パラメータであり、通常、露光条件の異なるロットによって異なる。したがって処理時間情報の設定は具体的には例えば、そのロットに適用する露光の種類をジョブ名等として種類指定手段によって指定し、指定されたジョブ名に対応する処理時間情報を記憶手段から読み出すことにより行なわれる。算出手段はそれらのウエハ枚数および処理時間情報に基づいて１ロットの露光処理に要する時間もしくはその処理の終了時刻を算出し、その値を表示手段が表示する。表示された処理時間や終了時刻は、容易に作業者によって認識され、装置の効率的な運用に供される。すなわち、半導体ウエハ製造ラインにおいて、装置の有効活用、生産効率の向上という観点から、次のように有効な情報として活用される。

【０００８】①複数の装置で複数のロットを流す場合、各ロットの終了予測時間からどの装置にどの順番でどういうロットを流すのが一番効果的かを知り、最も効率的な計画を立てるに有効に利用される。

②一人のオペレータが、複数の装置を操作、管理する場合、各装置に流すロットとその順番からどういう順で装置を見回る（操作する）のが一番効率的かを事前に知るのに利用される。

③工場内での休憩時間等にオペレータのアシスト（キャリア交換等）が必要とならないように、装置運営の計画を容易に立てるのに利用される。

【０００９】

【実施例】以下、本発明の実施例を図面を用いて説明する。

［実施例１］図１は本発明の第１の実施例に係る半導体露光装置の概略的な構成図である。図１において、１は露光光を発する照明装置、２はＸ、Ｙ、θ方向に移動可能な不図示のレチクルステージ上に搭載されているレチクル（マスク）、３は照明装置１によって照明されるレチクル２のパターンを縮小投影する縮小投影レンズ、４は縮小投影レンズ３によって投影が行なわれるウエハを保持してθ、Ｚ方向に移動可能なθＺステージ、５はθＺステージ４を搭載してＸ、Ｙ方向に移動可能なＸＹステージ、６は装置各ユニットの動作を制御するためのメインＣＰＵ、７はメインＣＰＵ６に接続されたコンソール（オペレータが操作する部分）である。コンソール７は、実際にはワークステーションなどを使用したものであり、コンソールＣＰＵ７－１、ＨＤ（記憶装置）７－２、ならびに表示および操作部７－３を備えている。ＨＤ７－２は露光に必要なデータをジョブファイルとして記憶している。

【００１０】コンソール７は、露光処理を行なう１ロットのウエハの枚数を指定する枚数指定手段、前記露光処理の各部分的処理に要する処理時間の情報を設定する設定手段、前記指定手段により指定されたウエハ枚数および前記設定手段により設定された処理時間情報に基づいて前記１ロットの露光処理に要する時間もしくはその処理の終了時刻を算出する算出手段、および、これによって算出された値を表示する表示手段を構成する。

【００１１】図２はこの装置の動作を示すフローチャートである。図２に示すように、オペレータが１ロットの露光処理に要する時間もしくはその処理の終了時刻を知りたい場合は、操作部７－３によりまずそのロットの処理に適用するジョブファイルを指定し、しかる後にそのロットで処理するウエハ枚数を指定する。

【００１２】するとコンソールＣＰＵ７－１は、指定されたジョブファイルに記憶されている各種パラメータ、およびステッパ内部の必要パラメータを読み出し、次の式によってロットの処理時間（Ｅｔ）を計算する。

処理時間（Ｅｔ）＝ウエハ枚数（Ｗ）×インデックスタイム（Ｉｔ）

前記インデックスタイム（Ｉｔ）は次式によって求められる。

$$It = Tw1 + Tp1 + Ta1 + (Te1 + (Txy1 + Tf1) \times Ns) \times Ne$$

但し、Tw1：ウエハ交換時間

Tp1：プリアライメント時間

Ta1：アライメント時間

Te1：露光時間

Txy1：ステージ駆動時間

Tf1：フォーカス時間

Ns：ステップ回数

Ne：露光ショット数

さらに、前記アライメント時間Ta1は次の式により求められる。

アライメント時間（Ta1）＝（Tas1＋Taxy1）×Na

但し、Tas1：アライメント計測時間

Taxy1：ステージ駆動時間

Na：アライメントのための計測ショット数

次に、オペレータが操作部７－３のスタートボタンを押すと、コンソールＣＰＵ７－１は、その時刻と処理時間（Ｅｔ）とから終了時刻（ＥＴ）を計算し、表示装置７－３上に表示する。このとき、ウエハ搬送系にインライン搬送系を含むものを想定すれば、ウエハ交換時間Tw1を補正することも可能である。

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【００１３】［実施例２］図３は本発明の第２の実施例に係る処理を示すフローチャートである。装置構成は実施例１の場合と同様である。実施例１においてはコンソール７において入力される以外のジョブファイルに記憶されている終了時刻計算のためのパラメータは固定されいるが、この値がずれていた場合を考え、ここでは、それを校正する手段を有する。この校正を１回毎のロット処理のたびに繰り返すことにより、終了時刻の計算値が次第に正確になる。校正するパラメータとしては、ステージ駆動時間、アライメント計測時間（ウエハの表面状態などにより異なるため）、露光時間（光源となるランプの寿命、使用時間等で照度が変わるため）等が考えられる。

【００１４】すなわち、終了時刻を計算し表示するところまでは、実施例１の場合と同様であるが、ここでは、その後、実際に露光がスタートしたらメインＣＰＵ６は、ウエハ交換時間Ｔwl、プリアライメント時間Ｔpl、露光時間Ｔel、ステップ時間Ｔsl、アライメント時間Ｔal（アライメント計測時間Ｔalとアライメントのためのステージ駆動時間Ｔaxylからなる）等の各パラメータを計測し、コンソールＣＰＵ６へ送る。これを受けると、コンソールＣＰＵ７－１はＨＤ７－２内のパラメータを更新する。更新されたパラメータを用いることにより、処理時間（Ｅｔ）および終了時刻（ＥＴ）の計算が正確になる。

【００１５】［実施例３］ここでは、装置が何らかの理由で停止した場合を想定し、再び装置が実行状態となったときには、実施例１や２におけるウエハ枚数（Ｗ）の代わりにウエハ残枚数（Ｗ’）を用いて処理時間（Ｅｔ）および終了時刻（ＥＴ）の計算を行ない表示する。他の点は、実施例１や実施例２の場合と同様である。

【００１６】［実施例４］実施例１～３では、コンソール７から何の指定がなくても終了時刻を表示していたが、ここでは、予め終了予測時刻表示コマンドなるものを設定し、露光条件が指定された時にそのコマンドを操作部７－３により入力すると、あるいはそのような指令を生じるボタンを押すと、コンソールＣＰＵ７－１は処理時間（Ｅｔ）および終了時刻（ＥＴ）を表示部７－３に表示する。

【００１７】すなわち、オペレータが所定のコマンドを入力すると、コンソールＣＰＵ７－１は図４に示すようなウィンドウを表示部７－３に表示し、そのウィンドウに従って、オペレータは入力エリアａにおいてジョブファイルを指定し、しかる後にウエハ枚数を入力エリアｂで指定する。その後、オペレータがＴｉｍｅボタンを押すと、コンソールＣＰＵ７－１は指定されたジョブファイルのパラメータおよびウエハ枚数に基づいて処理時間（Ｅｔ）および終了時刻（ＥＴ）を計算し、処理時間（Ｅｔ）を表示エリアｅに表示し、終了時刻を（ＥＴ）表示エリアｄに表示する。表示エリアｃは現在時刻を表示しているエリアである。

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【００１８】このように、オペレータが処理時間（Ｅｔ）および終了時刻（ＥＴ）を容易に把握できるようにすることにより、運用上、例えば次のような有利な効果を得ることができる。この運用例は、図５に示すように、上述の実施例１～４のいずれかを用いた複数台の露光装置を使用する場合に該当する。このような構成の半導体製造ラインにおいて、エンジニアが、次のような仕事をしなければならない場合を想定する。

【００１９】・現在時刻は１２：４５である。
・露光装置は３台あり、現在１台は、ロットの処理中で、その終了予定時刻は１４：００、そして残りの２台は空きである。
・仕事は１７：００までに終了しなければならない。
・オペレータのロットの交換時間（キャリア交換時間、ジョブ切替え等）には５分間必要である。
・この日のオペレータは１人しかいないものとする。
・１５：００からは工場の休憩時間が１０分間あり、この間はオペレータは仕事をしない。

【００２０】この状況下で、定刻までに処理しなければならないロットの処理時間は次の６種類ある。
Ａ：処理に３０分かかる。
Ｂ：処理に２時間かかる。
Ｃ：処理に３時間かかる。
Ｄ：処理に２時間半かかる。
Ｅ：処理に１時間かかる。
Ｆ：処理に１時間半かかる。
このようなケースでの効率運用を考える。この場合、図５の露光装置５１が現在稼働中であり、露光装置５２および５３は稼働していないものとすると、図６のような形ですべてのロットについての処理を終了することができる。

【００２１】これはあくまで１例であるが、本発明により、このように半導体ラインの生産計画を立てることが容易となる。

【００２２】

【発明の効果】以上説明したように本発明によれば、処理スタート時、あるいは実際の処理とは無関係にいつでも、ジョブ名、処理枚数等を指定するだけで、ロットの終了時間、１ロットの処理時間および終了時刻を計算し、表示するようにしたため、それらを作業者が直ちにかつ容易に把握することができる。また、処理時間情報を実際の処理時間の計測結果から修正することにより、１ロットの処理時間および終了時刻の算出をより正確に行なうことができる。そして、このようにして把握できる１ロットの処理時間および終了時刻を利用して露光装置を効率的に運用することができる。

【図面の簡単な説明】

【図１】　本発明の第１の実施例に係る半導体露光装置の概略的な構成図である。

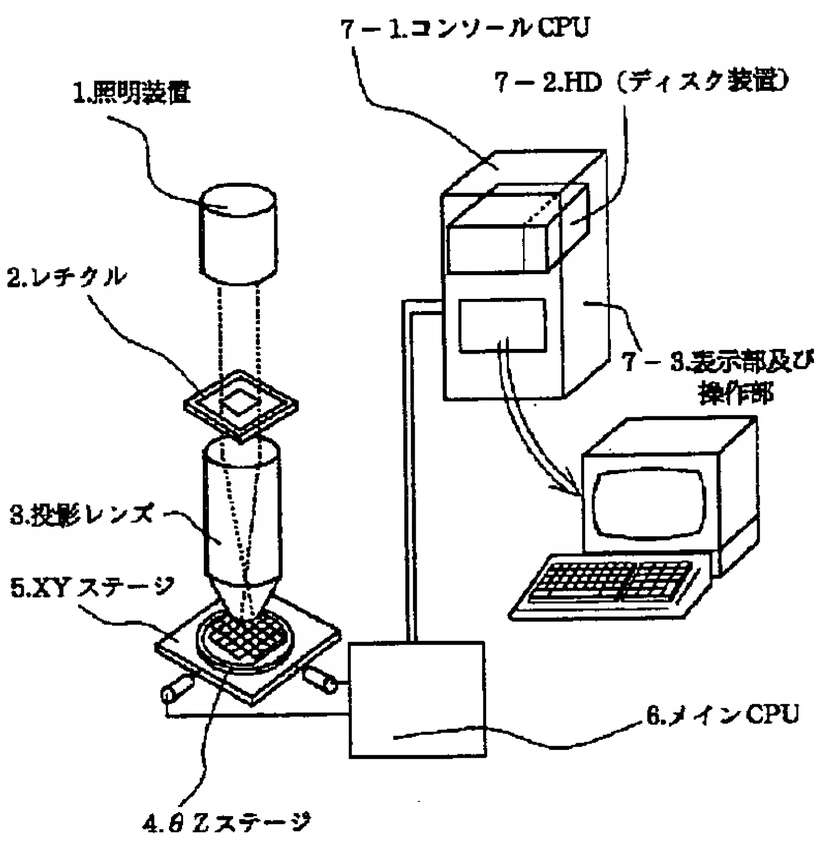
【図２】　図１の装置の動作を示すフローチャートである。

【図３】　本発明の第２実施例に係る処理を示すフローチャートである。

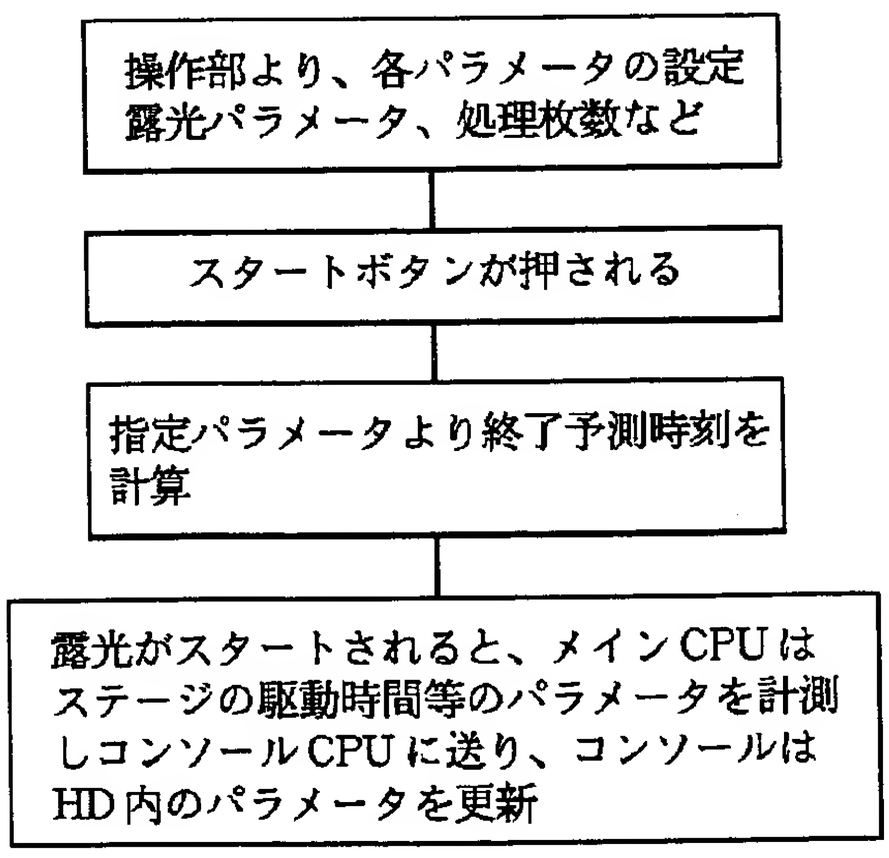
【図４】　本発明の第４実施例における処理に係るコンソール画面の例を示す図である。

【図５】　本発明の実施例の効果を示すのに用いる構成を示す図である。

【図１】



【図３】

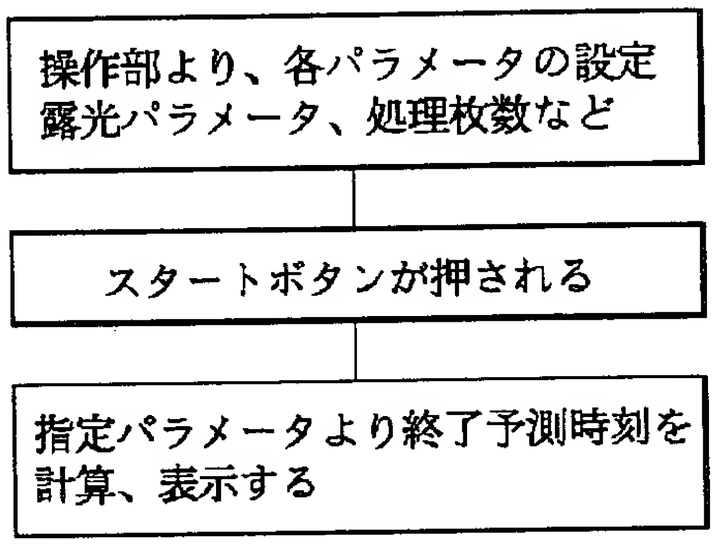


【図６】　本願発明の効果を説明するための図である。

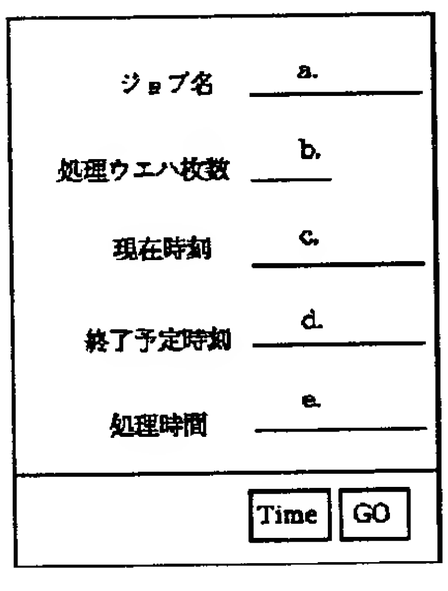
【符号の説明】

１：照明装置、２：レチクル（マスク）、３：縮小投影レンズ、４：θＺステージ、５：ＸＹステージ、６：メインＣＰＵ、７：コンソール、７－１：コンソールＣＰＵ、７－２：ＨＤ（記憶装置）、７－３：表示部および操作部、５１～５３：露光装置。

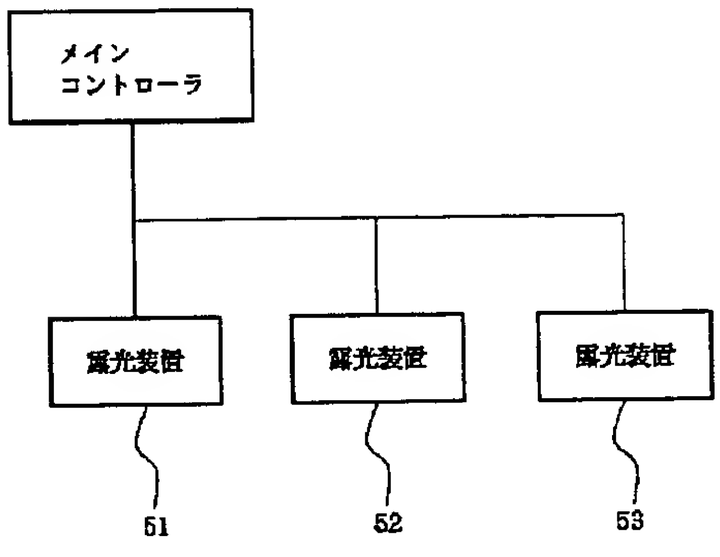
【図２】



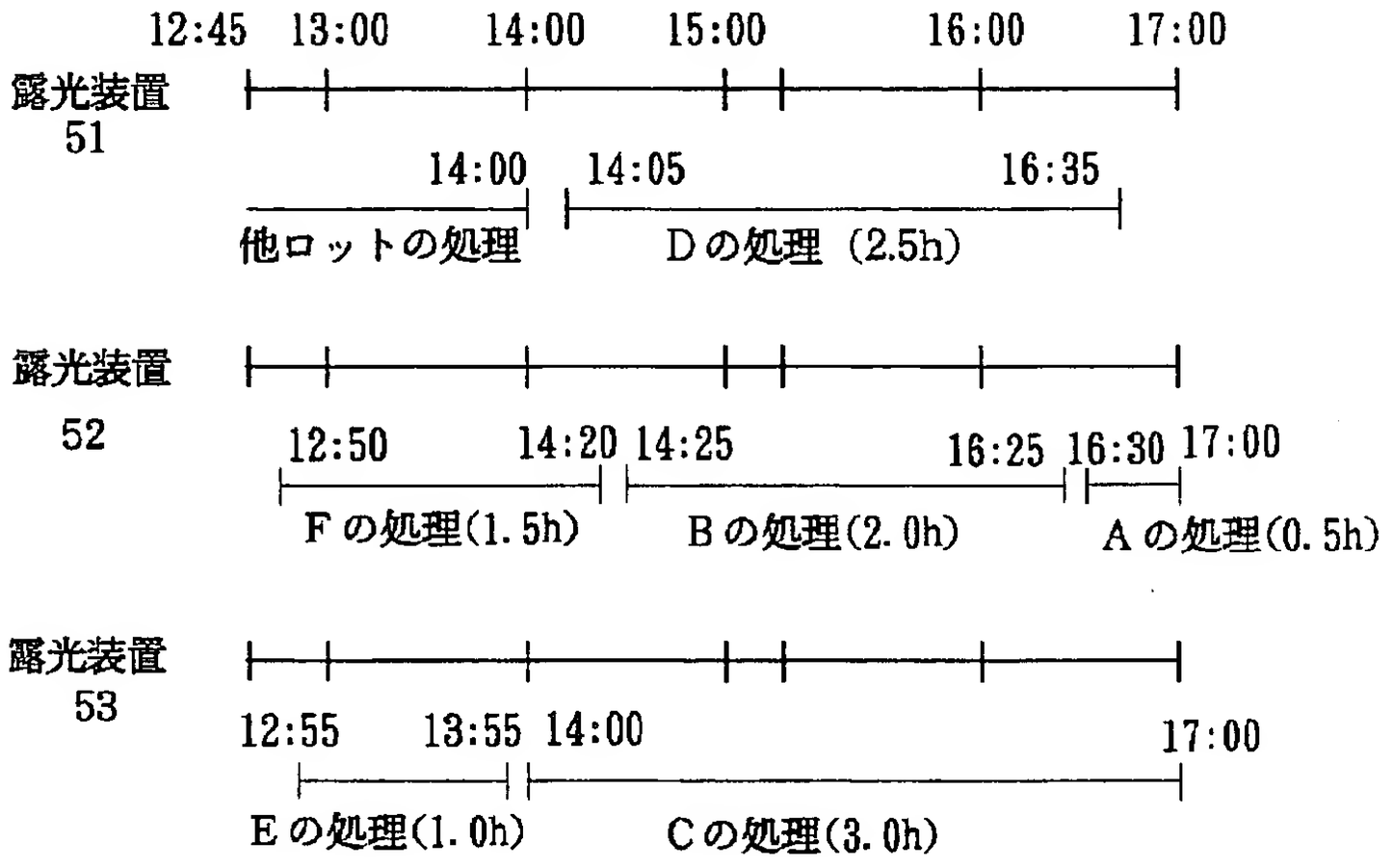
【図４】



【図５】



【図６】


12:45
13:00
14:00
15:00
16:00
17:00
露光装置
51
14:00
14:05
16:35
他ロットの処理
Dの処理（2.5h）
露光装置
52
12:50
14:20
14:25
16:25
16:30
17:00
Fの処理(1.5h)
Bの処理(2.0h)
Aの処理(0.5h)
露光装置
53
12:55
13:55
14:00
17:00
Eの処理(1.0h)
Cの処理(3.0h)

* NOTICES *

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damages caused by the use of this translation.

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] A number-of-sheets assignment means to specify the number of sheets of the wafer of one lot which performs exposure processing, A setting means to set up the information on the processing time which each partial processing of said exposure processing takes, A calculation means to compute the time amount which exposure processing of said one lot takes based on the processing-time information set up by the wafer number of sheets specified by said assignment means, and said setting means, or the end time of the processing, The semi-conductor aligner characterized by providing a display means to display the value computed by this.
[Claim 2] A setting means is a semi-conductor aligner according to claim 1 characterized by to have a storage means to by_which said processing-time information according to the class of said exposure processing has been memorized, a class assignment means specify the class of the exposure processing, and the read-out means that reads the processing-time information on the exposure processing corresponding to the class inputted by this from said storage means.
[Claim 3] The semi-conductor aligner according to claim 2 characterized by having a measurement means to measure the time amount which said partial processing takes, and an amendment means to amend the processing-time information memorized by said storage means based on this measurement result.
[Claim 4] claims 1-3 characterized by a display means being what displays said time amount or time of day at the time of the start of exposure processing of said one lot -- a semi-conductor aligner given in either.
[Claim 5] It is the semi-conductor aligner according to claim 1 to 3 characterized by said calculation means and a display means being what performs the processing when it is independently operational in exposure processing always and, as for a number-of-sheets assignment means and a setting means, these are operated.
[Claim 6] claims 1-5 characterized by having a command means for making the display of said time amount or time of day perform to said display means at the time of arbitration -- a semi-conductor aligner given in either.
[Claim 7] claims 1-6 which compute the time amount which processing of an unsettled wafer takes, or the end time of the processing based on said processing-time information and said unsettled number of sheets, and are characterized by for a display means to be what displays the calculation value when equipment is recovered, after it has a means count the unsettled number of sheets of the wafer in said lot and equipment stops a calculation means for a certain reason -- a semi-conductor aligner given in either.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to the thing which enabled it to display the processing time and end time in a lot unit about the semi-conductor aligner which can be burned in a circuit pattern on a wafer.
[0002]
[Description of the Prior Art] The semi-conductor aligner used for manufacture of a semi-conductor, for example, a stepper, processes many wafers by the lot unit. At this time, exposure conditions, alignment conditions, etc. change with lots. Conventionally, the operator predicts the processing end time and time of day of this lot unit from the experience till then etc.
[0003]
[Problem(s) to be Solved by the Invention] However, since this processing end time and time of day change with an exposure parameter, the internal parameters of a stepper, etc., it is difficult for an operator to predict exact end time. Therefore, there is a trouble that an operator needs to look at equipment in fact, it is necessary to turn or, and idle time arises to equipment. In a semi-conductor plant, since the cost of a facility is high, it becomes important on the cost control of a product to make it work without vacating equipment as much as possible. Especially, in Rhine of limited production with a wide variety, and prototype Rhine of a new product, since various wafers are poured to one set of an aligner, the above troubles occur in many cases.
[0004] This invention is a thing in consideration of the above-mentioned situation, and it aims at an operator enabling it to grasp processing termination prediction time amount and time of day, having them easily, and enabling it to employ an aligner efficiently in a semi-conductor aligner.
[0005]
[Means for Solving the Problem] In order to attain this purpose the semi-conductor aligner of this invention A number-of-sheets assignment means to specify the number of sheets of the wafer of one lot which performs exposure processing, A setting means to set up the information on the processing time which each partial processing of said exposure processing takes, A calculation means to compute the time amount which exposure processing of said one lot takes based on the processing-time information set up by the wafer number of sheets specified by said assignment means and said setting means, or the end time of the processing, and a display means to display the value computed by this are provided.
[0006] It is as follows if a more concrete mode is illustrated. That is, a setting means is equipped with a storage means by which said processing-time information according to the class of exposure processing is memorized, a class assignment means to specify the class of the exposure processing, and the read-out means that reads the processing-time information on the exposure processing corresponding to the class inputted by this from said storage means. This equipment has a measurement means to measure further the time amount which said partial processing takes, and an amendment means to amend the processing-time information memorized by said storage means based on this measurement result. A display means displays said time amount or time of day at the time of the start of exposure processing of said one lot. Regardless of exposure processing, it is operational in a number-of-sheets assignment means and a setting means always, and when these are operated, as for said calculation means and a display means, it may be made to perform the processing. This equipment has a command means for making the display of said time amount or time of day perform to said display means at the time of arbitration further. After this equipment has a means to count the unsettled number of sheets of the wafer in said lot further and equipment stops a calculation means for a certain reason, when equipment is recovered, based on said processing-time information and said unsettled number of sheets, the time amount which processing of an unsettled wafer takes, or the end time of the processing is computed, and a display means displays the calculation value.
[0007]
[Function] In this configuration, in case exposure processing is performed using an aligner, in order to display the time amount which exposure processing of one lot takes, or the end time of that processing, the number of sheets of the processing wafer of one lot is specified with a number-of-sheets assignment means, and processing-time information is set up with a setting means. This processing-time information is exposure parameters and the interior parameters of a stepper, such as the exposure time and a count of a step, and usually changes with lots with which exposure conditions differ. Therefore, by making into a job name etc. the class of exposure specifically applied to the lot, a setup of processing-time information is specified with a class assignment means, and is performed by reading the processing-time information corresponding to the specified job name from a storage means. A calculation means computes the

time amount which exposure processing of one lot takes based on those wafer number of sheets and processing-time information, or the end time of the processing, and a display means displays the value. The processing time and end time which were displayed are easily recognized by the operator, and efficient employment of equipment is presented with them. That is, in a semi-conductor wafer production line, it is utilized as effective information as follows from a viewpoint of effective use of equipment, and improvement in productive efficiency.
[0008] ** When pouring two or more lots with two or more equipments, it gets to know whether it is most effective for which equipment to pour what kind of lot in which sequence from the termination prediction time amount of each lot, and is used effective in forming the most efficient plan.
** It is used for getting to know whether the lot poured to each equipment and that which patrols equipment in what kind of order from the sequence (it is operated) are the most efficient in advance when one operator operates and manages two or more equipments.
** It is used for forming the plan of equipment management easily so that assistance (carrier exchange etc.) of an operator may not be needed for the recess in works etc.
[0009]
[Example] Hereafter, the example of this invention is explained using a drawing.
[Example 1] drawing 1 is the rough block diagram of the semi-conductor aligner concerning the 1st example of this invention. The lighting system with which 1 emits exposure light in drawing 1 , the reticle by which 2 is carried on the reticle stage which is not illustrated [movable in X, Y, and the direction of theta] (mask), The contraction projection lens which carries out contraction projection of the pattern of the reticle 2 by which 3 is illuminated with a lighting system 1, 4 holds the wafer to which projection is performed with the contraction projection lens 3. theta, Maine CPU for movable theta Z stage and 5 to carry theta Z stage 4 in a Z direction, and for X, an X-Y stage movable in the direction of Y, and 6 control actuation of equipment each unit and 7 are the consoles (part which an operator operates) connected to Maine CPU 6. In fact, the workstation etc. was used for the console 7 and it is equipped with the consoles [HD / CPU and / 7-2] 7-1 (storage), the display, and the control unit 7-3. HD 7-2 has memorized data required for exposure as a job file.
[0010] A number-of-sheets assignment means to specify the number of sheets of the wafer of one lot with which a console 7 performs exposure processing, A setting means to set up the information on the processing time which each partial processing of said exposure processing takes, A calculation means to compute the time amount which exposure processing of said one lot takes based on the processing-time information set up by the wafer number of sheets specified by said assignment means and said setting means, or the end time of the processing, and a display means to display the value computed by this are constituted.
[0011] Drawing 2 is a flow chart which shows actuation of this equipment. When an operator wants to know the time amount which exposure processing of one lot takes, or the end time of the processing as shown in drawing 2 , the job file first applied to processing of the lot by the control unit 7-3 is specified, and the wafer number of sheets processed with the lot after an appropriate time is specified.
[0012] Then, a console CPU 7-1 reads the various parameters memorized by the specified job file and the need parameter inside a stepper, and calculates the processing time (Et) of a lot by the following formula.
Processing-time (Et) = wafer (number-of-sheets W) x index time (It)
Said index time (It) is called for by the degree type.
It =Tw 1+Tp1+Ta1+(Te1+(Txy1+Tf1) xNs) xNe, however Tw1:wafer swap time Tp1:PURIARAIMENTO time Ta1:alignment time amount Te1 : exposure time Txy1 : Stage drive time amount Tf1: Focal time amount Ns : Count Ne of a step : An exposure shots-per-hour pan is asked for said alignment time amount Ta 1 by the following formula.
Alignment time amount (Ta1) = (Tas1+Taxy1) xNa, however Tas1 : Alignment measurement time amount Taxy1: Stage drive time amount Na : If the measurement shots per hour, next operator for alignment push the start button of a control unit 7-3, a console CPU 7-1 will calculate end time (ET) from the time of day and processing time (Et), and will display it on display 7-3. If what contains an in-line conveyance system in a wafer conveyance system is assumed at this time, it is also possible to amend the wafer swap time Tw1.
[0013] [Example 2] drawing 3 is a flow chart which shows processing concerning the 2nd example of this invention. The equipment configuration is the same as that of the case of an example 1. Although it is fixed and the parameter for the end time count memorized by the job file except being inputted in a console 7 in an example 1 is, the case where this value has shifted is considered and it has a means to proofread it here. By repeating this proofreading at every lot processing in every time, the calculated value of end time becomes exact gradually. As a parameter to proofread, stage drive time amount, alignment measurement time amount, the exposure time, etc. can be considered (since an illuminance changes by the life of the lamp used as the light source, a time, etc.). (since it changes with surface states of

·a wafer etc.)
[0014] Namely, after that, although it is the same as that of the case of an example 1 till the place which calculates and displays end time, if exposure actually starts, Maine CPU 6 will measure each parameter, such as the wafer swap time Tw1, the PURIARAIMENTO time Tp1, the exposure time Te 1, step time Ts1, and the alignment time amount Ta 1 (it consists of alignment measurement time amount Ta 1 and stage drive time amount Taxy1 for alignment), and will send it to a console CPU 6 here. If this is received, a console CPU 7-1 will update the parameter in HD 7-2. By using the updated parameter, count of the processing time (Et) and end time (ET) becomes exact.
[0015] [Example 3] Here, when equipment will be in a running state again supposing the case where equipment stops by a certain reason, the number of wafer ** sheets (W') is used instead of an example 1 or the wafer number of sheets (W) in 2, and it displays by performing count of the processing time (Et) and end time (ET). Other points are the same as that of the case of an example 1 or an example 2.
[0016] Although end time was displayed from the console 7 in the [example 4] examples 1-3 even if there was no assignment If the command is inputted by the control unit 7-3 when a so-called termination prediction time stamp command is set up beforehand and exposure conditions are specified here Or if the carbon button which produces such a command is pushed, a console CPU 7-1 will display the processing time (Et) and end time (ET) on a display 7-3.
[0017] That is, if an operator inputs a predetermined command, a console CPU 7-1 displays a window as shown in drawing 4 on a display 7-3, and according to the window, an operator will specify a job file in input area a, and will specify wafer number of sheets as after an appropriate time by input area b. Then, if an operator pushes the Time carbon button, a console CPU 7-1 will calculate the processing time (Et) and end time (ET) based on the parameter and wafer number of sheets of a job file which were specified, will display the processing time (Et) on the display area e, and will display end time on (ET) display area d. The display area c is area which shows current time.
[0018] Thus, when an operator enables it to grasp easily the processing time (Et) and end time (ET), the following advantageous effectiveness can be acquired on employment. This example of employment corresponds, when using two or more sets of the aligners using either of the above-mentioned examples 1-4, as shown in drawing 5 . In the semi-conductor production line of such a configuration, an engineer assumes the case where the following work must be done.
[0019] - Current time is 12:45.
- An aligner is with three set, a lot is processing current [one], the termination schedule time of day is 14:00, and the two remaining sets are openings.
- Work must be ended by 17:00.
- It is required for the swap time of an operator's lot for 5 minutes (carrier swap time, job change, etc.).
- the operator of this day shall have only one person
- From 15:00, as for an operator, the recess of works does not work for 10 minutes a **** and in the meantime.
[0020] the processing time of the lot which must be processed by scheduled time under this situation -- the following six kinds -- it is .
A: Processing takes 30 minutes.
B: Processing takes 2 hours.
C: Processing takes 3 hours.
D: Start processing for 2 hours and a half.
E: Processing takes 1 hour.
F: Start processing for 1 hour and a half.
Effectiveness employment in such a case is considered. In this case, the aligner 51 of drawing 5 is working now, and if aligners 52 and 53 shall not work, they can end the processing about all lots in a form like drawing 6 .
[0021] Although this is one example to the last, it becomes easy [forming production planning of semi-conductor Rhine in this way] by this invention.
[0022]
[Effect of the Invention] since a job name, processing number of sheets, etc. are only specified, the end time of a lot, the processing time of one lot, and end time are calculated and it was made to display regardless of the time of a processing start, or actual processing always according to this invention as explained above -- them -- an operator -- immediately -- or -- ** -- it can grasp easily. Moreover, the processing time of one lot and calculation of end time can be more correctly performed by correcting processing-time information from the measurement result of the actual processing time. And it can do in this way and an aligner can be efficiently employed using the processing time and end time of one lot which can be grasped.

[Translation done.]

.TECHNICAL FIELD

[Industrial Application] This invention relates to the thing which enabled it to display the processing time and end time in a lot unit about the semi-conductor aligner which can be burned in a circuit pattern on a wafer.

[Translation done.]

PRIOR ART

[Description of the Prior Art] The semi-conductor aligner used for manufacture of a semi-conductor, for example, a stepper, processes many wafers by the lot unit. At this time, exposure conditions, alignment conditions, etc. change with lots. Conventionally, the operator predicts the processing end time and time of day of this lot unit from the experience till then etc.

[Translation done.]

EFFECT OF THE INVENTION

[Effect of the Invention] since a job name, processing number of sheets, etc. are only specified, the end time of a lot, the processing time of one lot, and end time are calculated and it was made to display regardless of the time of a processing start, or actual processing always according to this invention as explained above -- them -- an operator -- immediately -- or -- ** -- it can grasp easily. Moreover, the processing time of one lot and calculation of end time can be more correctly performed by correcting processing-time information from the measurement result of the actual processing time. And it can do in this way and an aligner can be efficiently employed using the processing time and end time of one lot which can be grasped.

[Translation done.]

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] However, since this processing end time and time of day change with an exposure parameter, the internal parameters of a stepper, etc., it is difficult for an operator to predict exact end time. Therefore, there is a trouble that an operator needs to look at equipment in fact, it is necessary to turn or, and idle time arises to equipment. In a semi-conductor plant, since the cost of a facility is high, it becomes important on the cost control of a product to make it work without vacating equipment as much as possible. Especially, in Rhine of limited production with a wide variety, and prototype Rhine of a new product, since various wafers are poured to one set of an aligner, the above troubles occur in many cases.

[0004] This invention is a thing in consideration of the above-mentioned situation, and it aims at an operator enabling it to grasp processing termination prediction time amount and time of day, having them easily, and enabling it to employ an aligner efficiently in a semi-conductor aligner.

[Translation done.]

MEANS

[Means for Solving the Problem] In order to attain this purpose, it is characterized by equipping the semi-conductor aligner of this invention with the following. A number-of-sheets assignment means to specify the number of sheets of the wafer of one lot which performs exposure processing A setting means to set up the information on the processing time which each partial processing of said exposure processing takes A calculation means to compute the time amount which exposure processing of said one lot takes based on the processing-time information set up by the wafer number of sheets specified by said assignment means, and said setting means, or the end time of the processing A display means to display the value computed by this

[0006] It is as follows if a more concrete mode is illustrated. That is, a setting means is equipped with a storage means by which said processing-time information according to the class of exposure processing is memorized, a class assignment means to specify the class of the exposure processing, and the read-out means that reads the processing-time information on the exposure processing corresponding to the class inputted by this from said storage means. This equipment has a measurement means to measure further the time amount which said partial processing takes, and an amendment means to amend the processing-time information memorized by said storage means based on this measurement result. A display means displays said time amount or time of day at the time of the start of exposure processing of said one lot. Regardless of exposure processing, it is operational in a number-of-sheets assignment means and a setting means always, and when these are operated, as for said calculation means and a display means, it may be made to perform the processing. This equipment has a command means for making the display of said time amount or time of day perform to said display means at the time of arbitration further. After this equipment has a means to count the unsettled number of sheets of the wafer in said lot further and equipment stops a calculation means for a certain reason, when equipment is recovered, based on said processing-time information and said unsettled number of sheets, the time amount which processing of an unsettled wafer takes, or the end time of the processing is computed, and a display means displays the calculation value.

[Translation done.]

OPERATION

[Function] In this configuration, in case exposure processing is performed using an aligner, in order to display the time amount which exposure processing of one lot takes, or the end time of that processing, the number of sheets of the processing wafer of one lot is specified with a number-of-sheets assignment means, and processing-time information is set up with a setting means. This processing-time information is exposure parameters and the interior parameters of a stepper, such as the exposure time and a count of a step, and usually changes with lots with which exposure conditions differ. Therefore, by making into a job name etc. the class of exposure specifically applied to the lot, a setup of processing-time information is specified with a class assignment means, and is performed by reading the processing-time information corresponding to the specified job name from a storage means. A calculation means computes the time amount which exposure processing of one lot takes based on those wafer number of sheets and processing-time information, or the end time of the processing, and a display means displays the value. The processing time and end time which were displayed are easily recognized by the operator, and efficient employment of equipment is presented with them. That is, in a semi-conductor wafer production line, it is utilized as effective information as follows from a viewpoint of effective use of equipment, and improvement in productive efficiency.

[0008] ** When pouring two or more lots with two or more equipments, it gets to know whether it is most effective for which equipment to pour what kind of lot in which sequence from the termination prediction time amount of each lot, and is used effective in forming the most efficient plan.

** It is used for getting to know whether the lot poured to each equipment and that which patrols equipment in what kind of order from the sequence (it is operated) are the most efficient in advance when one operator operates and manages two or more equipments.

** It is used for forming the plan of equipment management easily so that assistance (carrier exchange etc.) of an operator may not be needed for the recess in works etc.

[Translation done.]

EXAMPLE

[Example] Hereafter, the example of this invention is explained using a drawing.
[Example 1] drawing 1 is the rough block diagram of the semi-conductor aligner concerning the 1st example of this invention. The lighting system with which 1 emits exposure light in drawing 1 , the reticle by which 2 is carried on the reticle stage which is not illustrated [movable in X, Y, and the direction of theta] (mask), The contraction projection lens which carries out contraction projection of the pattern of the reticle 2 by which 3 is illuminated with a lighting system 1, 4 holds the wafer to which projection is performed with the contraction projection lens 3. theta, Maine CPU for movable theta Z stage and 5 to carry theta Z stage 4 in a Z direction, and for X, an X-Y stage movable in the direction of Y, and 6 control actuation of equipment each unit and 7 are the consoles (part which an operator operates) connected to Maine CPU 6. In fact, the workstation etc. was used for the console 7 and it is equipped with the consoles [HD / CPU and / 7-2] 7-1 (storage), the display, and the control unit 7-3. HD 7-2 has memorized data required for exposure as a job file.
[0010] A number-of-sheets assignment means to specify the number of sheets of the wafer of one lot with which a console 7 performs exposure processing, A setting means to set up the information on the processing time which each partial processing of said exposure processing takes, A calculation means to compute the time amount which exposure processing of said one lot takes based on the processing-time information set up by the wafer number of sheets specified by said assignment means and said setting means, or the end time of the processing, and a display means to display the value computed by this are constituted.
[0011] Drawing 2 is a flow chart which shows actuation of this equipment. When an operator wants to know the time amount which exposure processing of one lot takes, or the end time of the processing as shown in drawing 2 , the job file first applied to processing of the lot by the control unit 7-3 is specified, and the wafer number of sheets processed with the lot after an appropriate time is specified.
[0012] Then, a console CPU 7-1 reads the various parameters memorized by the specified job file and the need parameter inside a stepper, and calculates the processing time (Et) of a lot by the following formula.
Processing-time (Et) = wafer (number-of-sheets W) x index time (It)
Said index time (It) is called for by the degree type.
It =Tw 1+Tp1+Ta1+(Te1+(Txy1+Tf1) xNs) xNe, however Tw1:wafer swap time Tp1:PURIARAIMENTO time Ta1:alignment time amount Te1 : exposure time Txy1 : Stage drive time amount Tf1: Focal time amount Ns : Count Ne of a step : An exposure shots-per-hour pan is asked for said alignment time amount Ta 1 by the following formula.
Alignment time amount (Ta1) = (Tas1+Taxy1) xNa, however Tas1 : Alignment measurement time amount Taxy1: Stage drive time amount Na : If the measurement shots per hour, next operator for alignment push the start button of a control unit 7-3, a console CPU 7-1 will calculate end time (ET) from the time of day and processing time (Et), and will display it on display 7-3. If what contains an in-line conveyance system in a wafer conveyance system is assumed at this time, it is also possible to amend the wafer swap time Tw1.
[0013] [Example 2] drawing 3 is a flow chart which shows processing concerning the 2nd example of this invention. The equipment configuration is the same as that of the case of an example 1. Although it is fixed and the parameter for the end time count memorized by the job file except being inputted in a console 7 in an example 1 is, the case where this value has shifted is considered and it has a means to proofread it here. By repeating this proofreading at every lot processing in every time, the calculated value of end time becomes exact gradually. As a parameter to proofread, stage drive time amount, alignment measurement time amount, the exposure time, etc. can be considered (since an illuminance changes by the life of the lamp used as the light source, a time, etc.). (since it changes with surface states of a wafer etc.)
[0014] Namely, after that, although it is the same as that of the case of an example 1 till the place which calculates and displays end time, if exposure actually starts, Maine CPU 6 will measure each parameter, such as the wafer swap time Tw1, the PURIARAIMENTO time Tp1, the exposure time Te 1, step time Ts1, and the alignment time amount Ta 1 (it consists of alignment measurement time amount Ta 1 and stage drive time amount Taxy1 for alignment), and will send it to a console CPU 6 here. If this is received, a console CPU 7-1 will update the parameter in HD 7-2. By using the updated parameter, count of the processing time (Et) and end time (ET) becomes exact.
[0015] [Example 3] Here, when equipment will be in a running state again supposing the case where equipment stops by a certain reason, the number of wafer ** sheets (W') is used instead of an example 1 or the wafer number of sheets (W) in 2, and it displays by performing count of the processing time (Et) and end time (ET). Other points are the same as that of the case of an example 1 or an example 2.
[0016] Although end time was displayed from the console 7 in the [example 4] examples 1-3 even if there was no

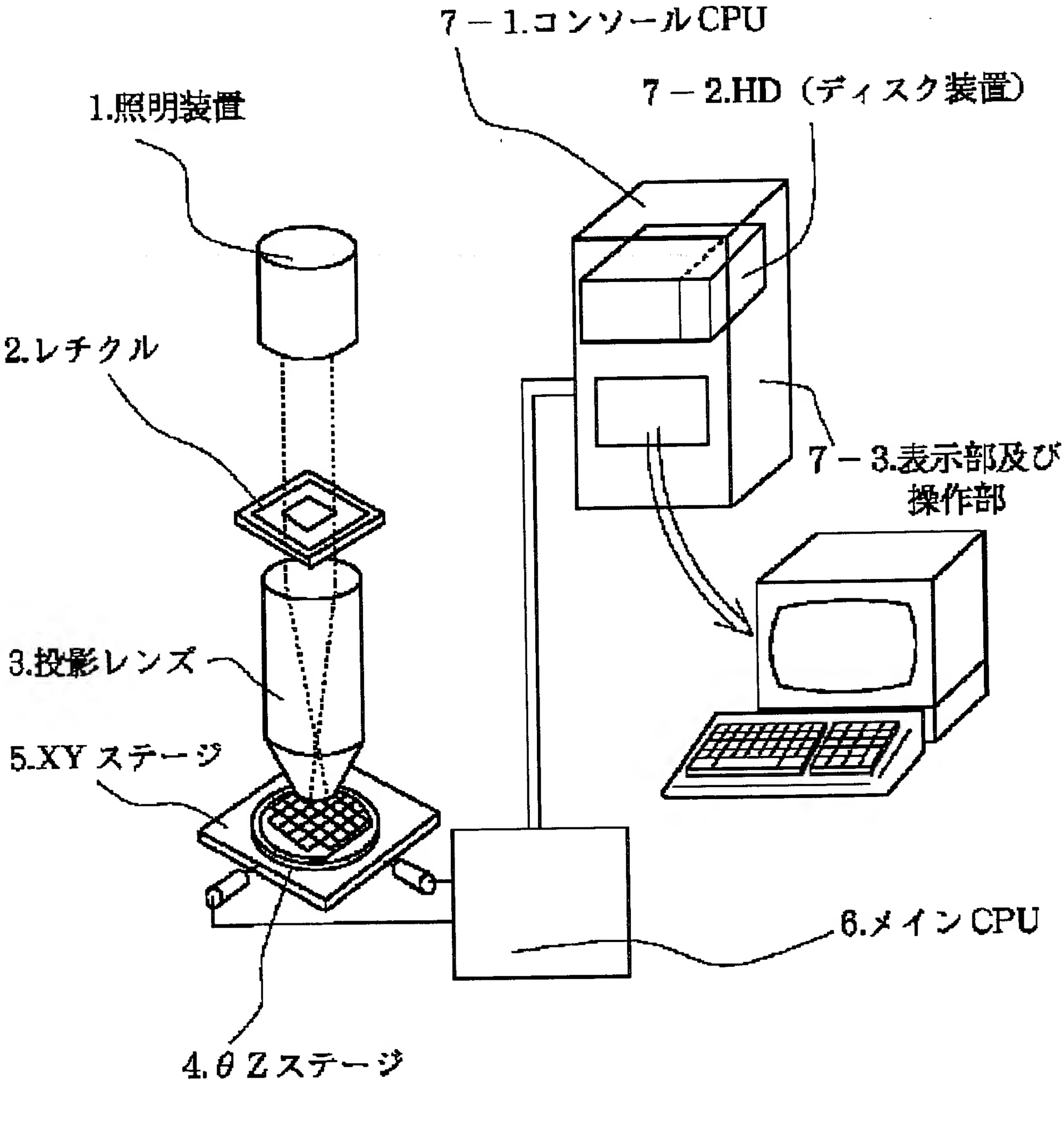
assignment If the command is inputted by the control unit 7-3 when a so-called termination prediction time stamp command is set up beforehand and exposure conditions are specified here Or if the carbon button which produces such a command is pushed, a console CPU 7-1 will display the processing time (Et) and end time (ET) on a display 7-3.
[0017] That is, if an operator inputs a predetermined command, a console CPU 7-1 displays a window as shown in drawing 4 on a display 7-3, and according to the window, an operator will specify a job file in input area a, and will specify wafer number of sheets as after an appropriate time by input area b. Then, if an operator pushes the Time carbon button, a console CPU 7-1 will calculate the processing time (Et) and end time (ET) based on the parameter and wafer number of sheets of a job file which were specified, will display the processing time (Et) on the display area e, and will display end time on (ET) display area d. The display area c is area which shows current time.
[0018] Thus, when an operator enables it to grasp easily the processing time (Et) and end time (ET), the following advantageous effectiveness can be acquired on employment. This example of employment corresponds, when using two or more sets of the aligners using either of the above-mentioned examples 1-4, as shown in drawing 5 . In the semi-conductor production line of such a configuration, an engineer assumes the case where the following work must be done.
[0019] - Current time is 12:45.
- An aligner is with three set, a lot is processing current [one], the termination schedule time of day is 14:00, and the two remaining sets are openings.
- Work must be ended by 17:00.
- It is required for the swap time of an operator's lot for 5 minutes (carrier swap time, job change, etc.).
- the operator of this day shall have only one person
- From 15:00, as for an operator, the recess of works does not work for 10 minutes a **** and in the meantime.
[0020] the processing time of the lot which must be processed by scheduled time under this situation -- the following six kinds -- it is .
A: Processing takes 30 minutes.
B: Processing takes 2 hours.
C: Processing takes 3 hours.
D: Start processing for 2 hours and a half.
E: Processing takes 1 hour.
F: Start processing for 1 hour and a half.
Effectiveness employment in such a case is considered. In this case, the aligner 51 of drawing 5 is working now, and if aligners 52 and 53 shall not work, they can end the processing about all lots in a form like drawing 6 .
[0021] Although this is one example to the last, it becomes easy [forming production planning of semi-conductor Rhine in this way] by this invention.

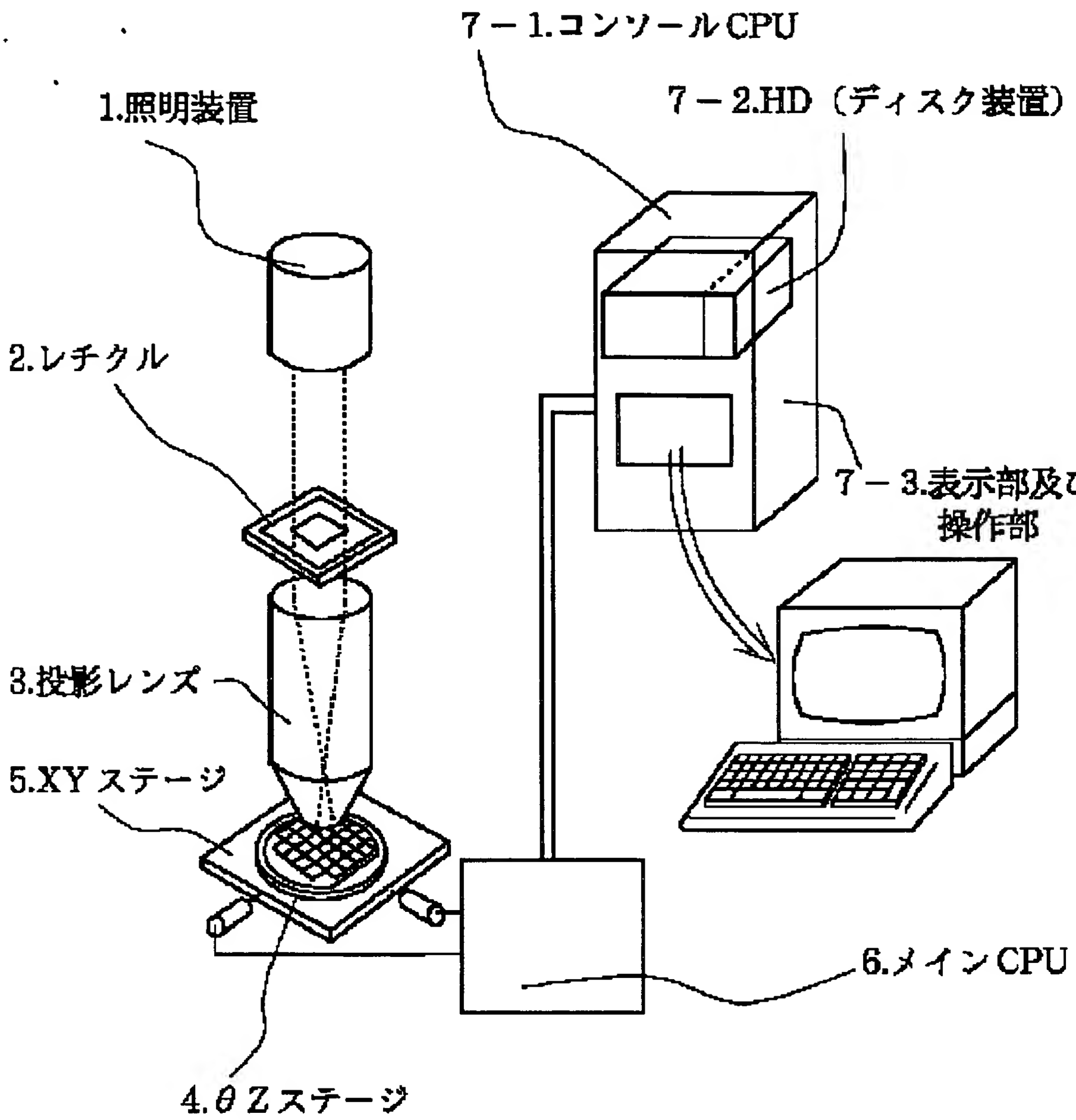
[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the rough block diagram of the semi-conductor aligner concerning the 1st example of this invention.
[Drawing 2] It is the flow chart which shows actuation of the equipment of drawing 1 .
[Drawing 3] It is the flow chart which shows processing concerning the 2nd example of this invention.
[Drawing 4] It is drawing showing the example of the console screen concerning the processing in the 4th example of this invention.
[Drawing 5] It is drawing showing the configuration used for the effectiveness of the example of this invention being shown.
[Drawing 6] It is drawing for explaining the effectiveness of the invention in this application.
[Description of Notations]
1: Lighting-system, 2:reticle (mask), 3:contraction projection lens, 4:theta Z stage, 5:X-Y stage, and 6:Maine CPU, 7:console, the 7-1:console CPU, 7-2:HD (storage), a 7-3:display and a control unit, 51-53 : aligner.

[Translation done.]


7－1.コンソールCPU
7－2.HD（ディスク装置）
1.照明装置
2.レチクル
7－3.表示部及び
操作部
3.投影レンズ
5.XY ステージ
6.メインCPU
4.θZステージ


7－1.コンソールCPU
1.照明装置
7－2.HD（ディスク装置）
2.レチクル
7－3.表示部及び
操作部
3.投影レンズ
5.XY ステージ
6.メインCPU
4.θZステージ

操作部より、各パラメータの設定
露光パラメータ、処理枚数など

スタートボタンが押される

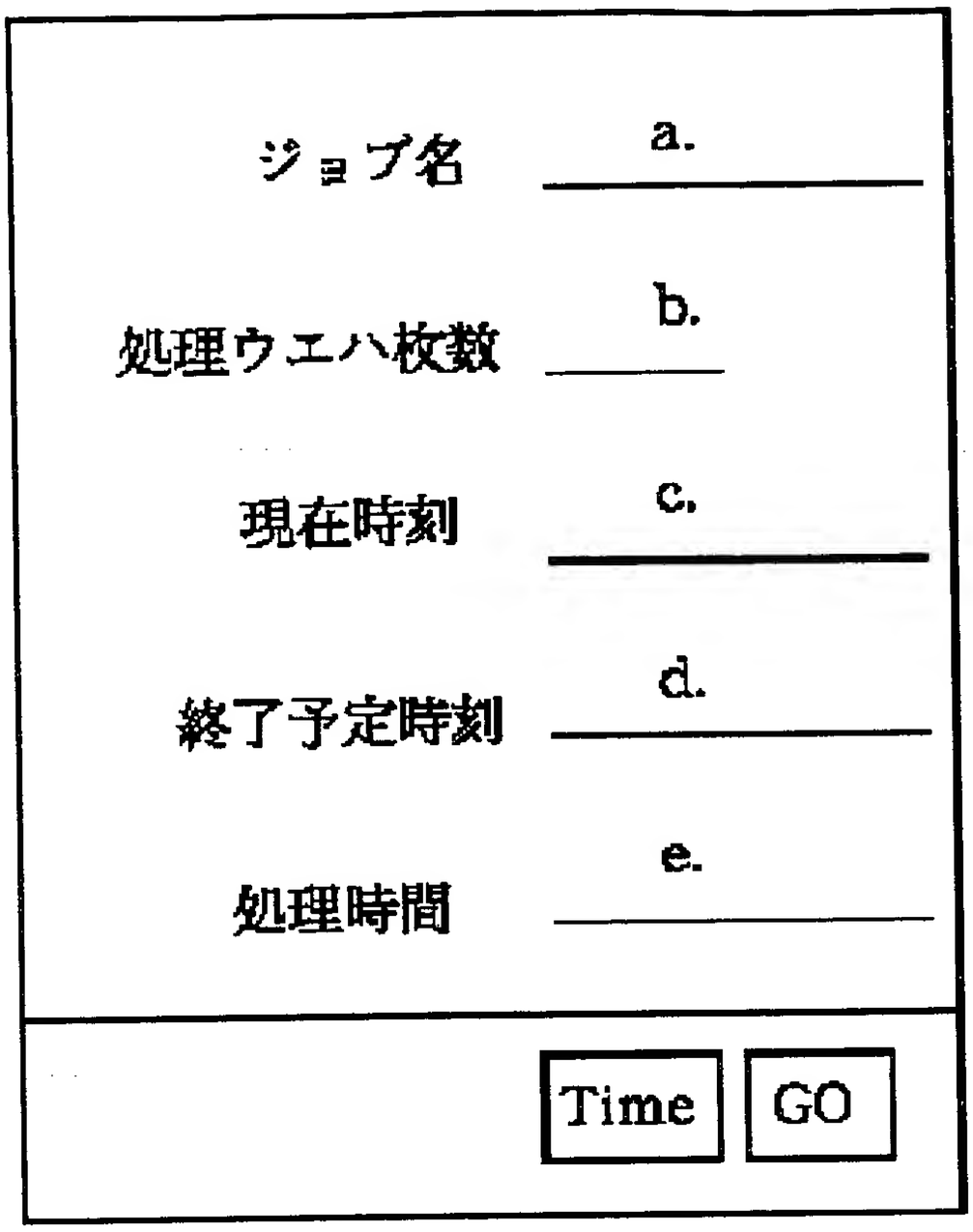
指定パラメータより終了予測時刻を
計算、表示する

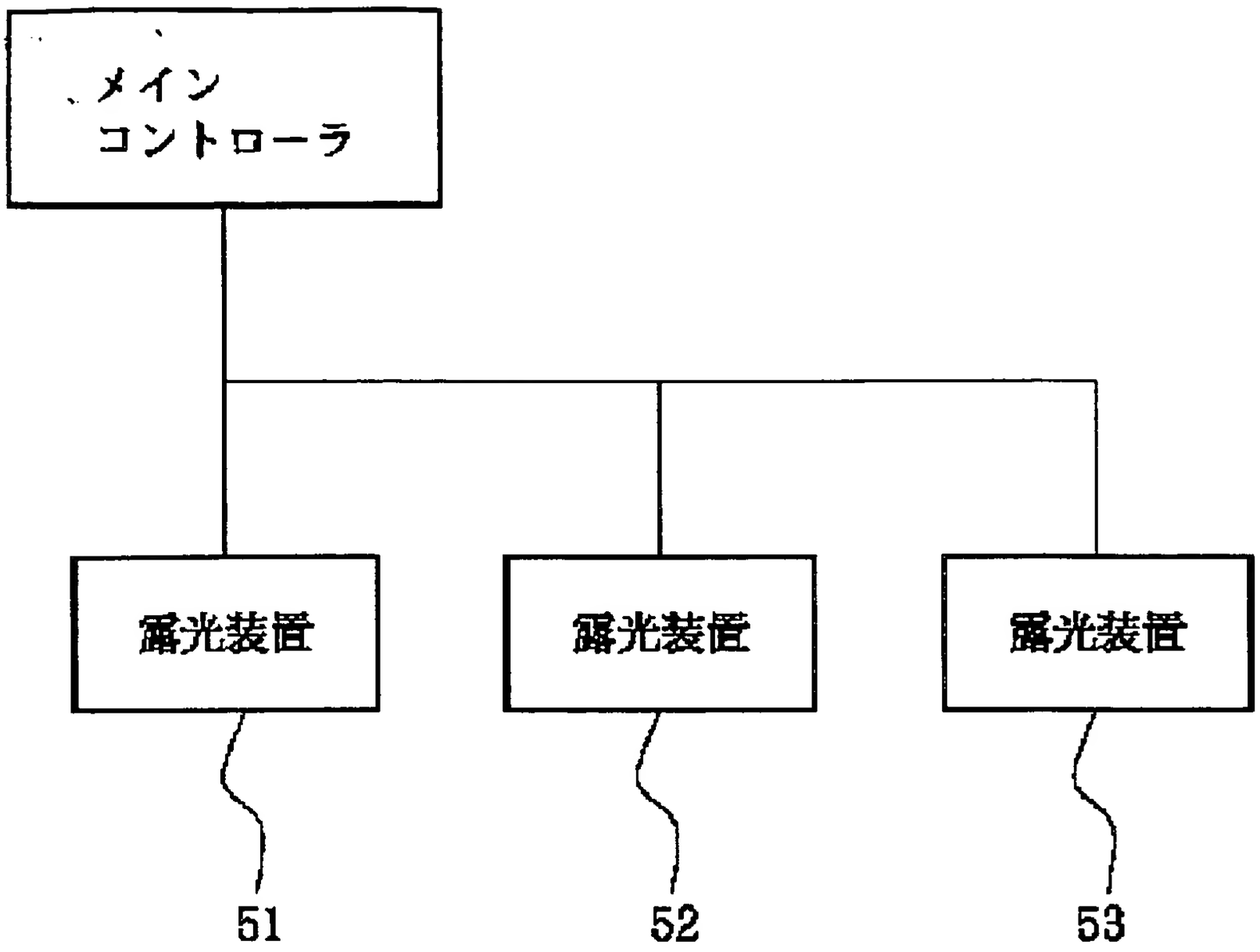
操作部より、各パラメータの設定
露光パラメータ、処理枚数など

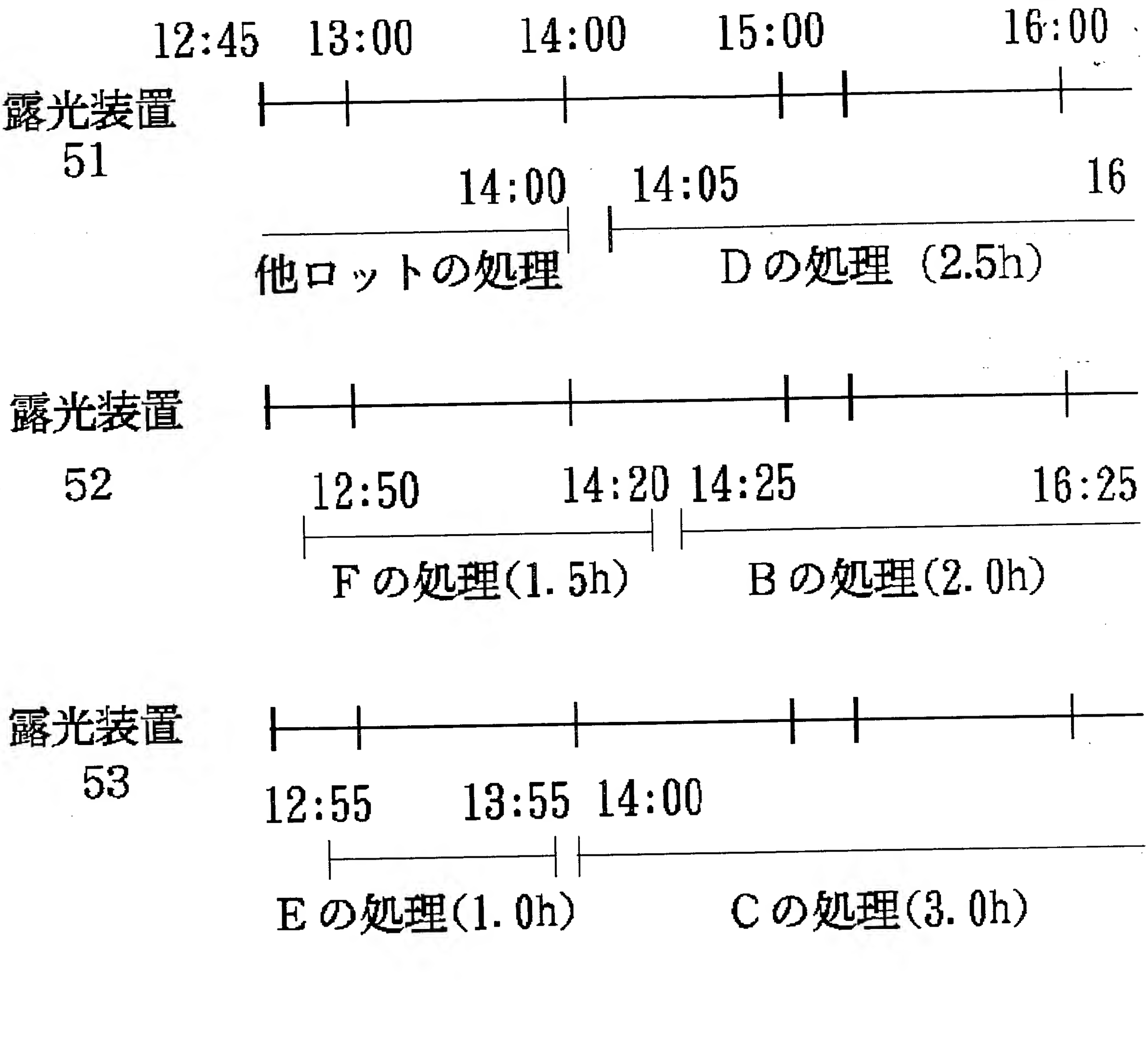
スタートボタンが押される

指定パラメータより終了予測時刻を
計算

露光がスタートされると、メインCPUは
ステージの駆動時間等のパラメータを計測
しコンソールCPUに送り、コンソールは
HD内のパラメータを更新


ジョブ名
a.
処理ウエハ枚数
b.
現在時刻
c.
終了予定時刻
d.
処理時間
e.
Time
GO


メイン
コントローラ
露光装置
露光装置
露光装置
51
52
53


12:45
13:00
14:00
15:00
16:00
露光装置
51
14:00
14:05
16
他ロットの処理
Dの処理（2.5h）
露光装置
52
12:50
14:20
14:25
16:25
Fの処理(1.5h)
Bの処理(2.0h)
露光装置
53
12:55
13:55
14:00
Eの処理(1.0h)
Cの処理(3.0h)